

MODIS TEAM MEETING

Distribution:

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<u>FLOREZ, JOSE</u>	<u>MONTGOMERY, HARRY</u>	<u>WEBER, DICK</u>
<u>GODDEN, GERRY</u>	PARK, HONGWOO	<u>HURD, JOHN</u>
<u>GRAZIANI, LARISSA</u>	PHILLIPS, HELEN	<u>PECORI, PETE</u>

February 27, 1996 Attendees are marked in **BOLD and Underlined**

The Following items are included in this package:

- 1) SBRC Weekly Submission Memos form week 222
- 2) CDRL-521 - MODIS Weekly Status Rpt. week ending 3-1-96
- 3) MODIS Technical Weekly

MODIS Technical Weekly March 1, 1996
sent to MODIS.Review on 3/5/96 at about

The retirement luncheon for John Bauernschub will be held on Wednesday, March 6, at the 94th Aero Squadron at 11:30.

The MODIS QMR will be held at SBRS on Tuesday, March 26. There will be splinter sessions on Wednesday, March 27.

George Daelemans presented a description of the MODIS thermal models and thermal analyses at the brown bag seminar held at the SAIC/GSC MODIS Support Office on Wednesday, February 28. The discussion included GSFC thermal analyses of the planned changes by SBRS to cool the optics. Several project and MCST personnel were in attendance. The presentation was very informative and was well received.

An issue at this time involves the pointing accuracy and knowledge specifications for MODIS. SBRS has unofficially been asked to submit a deviation/waiver. Preliminary indications are that a small misalignment of the scan mirror axis is only a pointing issue and not a band to band registration issue. If this is true, then it is expected that shimming of the scan mirror assembly will not be required.

Sal Cicchelli has developed an initial MODIS vibro-acoustic checklist which he provided to Al DeForrest. Sal also provides information on the scan mirror motor bearing lubricant.

George has also prepared a memo describing what he considers to be the minimal amount of IR testing of the Circuit Card Assemblies (CCAs) to assure the long term reliability of the MODIS electronics. Each unique card layout needs to be IR imaged, while powered, over the qualification range. Additionally, George believes every board that is going to fly on this mission deserves a room temperature powered IR image as a workmanship check.

Jose Florez has an input from Ed Clement that SBRS is planning to vacuum image the Protoflight (PF) Formatter board, in lieu of the Engineering Model (EM) board. This will complete the vacuum imaging they were going to do for the EM. He has requested a final report from Dave Lakomski at Hughes and will forward it when it is received. SBRS's current plan is to thermal image all PF CCAs in air at ambient temperature for the MEM, FAM, SAM CCAs. It did not get done for the SRCA and SDAM boards which are very small with only a few components.

Jose also reported that SBRS is in the process of issuing a procedure for Workmanship Temperature Cycling (SBRS #153546) of unpowered electronics CCAs. The procedure does not require a hard copy of the temperature cycling data (such as a circular graph). This means there will not be any documentation of equipment problems which could result in the CCAs being stressed.

Ed Knight has a response to the December QMR action item #3. This was an action on GSFC/MCST to determine if earth scene data must be preserved if the calibration sector is delayed:

- 1) If the SRCA sector undergoes a vernier delay during its Spatial Calibration Mode, GSFC expects this would have no effect on Earth scene data collection and the Earth scene data must be preserved.
- 2) If the data sectors are rotated so the Earth View Sector scans the instrument cavity, Earth scene data would not be preserved.
- 3) If the solar diffuser sector is rotated to allow scanning the upper corner of the cavity to monitor changes in response versus scan angle, GSFC would want to assure the Earth scene data is preserved.

John Mehrten provides EOS telemetry alarm limit philosophy.

Hongwoo Park comments that 9 pieces are used to make the 24 inch by 24 inch Labsphere halon diffuser plate. The largest single piece available is 19 inches by 22 inches.

Dan Powers has prepared three thermal analysis memos:

- 1) He updated the instrument flight temperature predictions based on the recent design modifications.
- 2) Dan updated the survival heater requirements. The FAM heater requires 10.5 watts for the Sun Pointing Safe Mode (SPSM) instead of the allocated 10 watts.
- 3) He also provided electronics module temperature predictions for survival heater failure scenarios.
 - a) Instrument is at steady state for a baseline cold case and the S/C goes into SPSM. If the survival heaters do not turn on, the electronics modules begin to fall below their minus 35 degree C qualification temperatures after about 20 hours.
 - b) The S/C has been in SPSM long enough for the MODIS to reach thermal steady state with the FAM, SAM, and MEM controlled to minus 20 degrees C. If the survival heaters then turn off, the electronics modules fall below their minus 35 degree C qualifying temperatures after about 5 hours. Note that the CLAM is already at minus 38 degrees C before the other survival heaters turn off. The CLAM has no survival heaters and would be at about minus 41 degrees C after 5 hours.

Jim Young has provided a response to the GSFC comments on deletion of STR 60 (to measure water vapor absorption). Jim provides arguments countering some of GSFC's concerns about not running STR 60.

The detailed team member inputs and summaries of the GSFC technical memos are included in the Appendix.

MR

3/4/96

APPENDIX

I. Sal Cicchelli (Initial Vibro-Acoustic Checklist, MODIS scan mirror motor bearing lubricant)

Author: Sal Cicchelli <scicchel@div720.gsfc.nasa.gov> at Internet

Date: 2/29/96 4:09 PM

Subject: **MODIS Initial Vibro-Acoustic Checklist Transmittal to SBRC**

----- Message Contents -----

I have sent Al DeForrest an initial vibro-acoustic qualification checklist as attached.

- Sal

Date: 27 Feb 1996 16:54:01 -0800

From: "De Forrest, Allen L" <adeforrest@msmail3.hac.com>

Return-Receipt-To: "De Forrest, Allen L" <adeforrest@msmail3.hac.com>

Subject: RE: MODIS Vibro-Acoustic Qualification Checklist

To: "Sal Cicchelli" <scicchel@div720.gsfc.nasa.gov>

X-Mailer: Mail*Link SMTP-MS 3.0.2

I have forwarded your e-mail to the MODIS Systems Integration and Test director, Duane Bates. He will give serious consideration to your comments as will I.

From: Sal Cicchelli on Mon, Feb 26, 1996 9:05 AM

Subject: MODIS Vibro-Acoustic Qualification Checklist

To: De Forrest, Allen L

Al-

MODIS vibro-acoustic qualification checklist items:

A. I have reviewed the Test Procedure SBRC document 152804, " Acoustic Exposure, Test Procedure for", and offer the following comments:

1. On page 9, " MODIS shall be mounted via flight kinematic mounts ... on shipping container ... I suggest that since the flight (titanium) mounts are life-limited, that they be used only where absolutely necessary, and that CRES mounts be used everywhere else, like testing and transportation.

2. Regarding the double bagging section (p. 12):

a. An attenuation analysis (difference of dB level across the boundary of the double bag over the entire frequency range) should be done to estimate the adequacy of the level of acoustic energy impinging on the test item. Do you have, or plan to do this analysis ? The data which would be needed to do an attenuation analysis are : the bag material and thickness, and spacing between bags. Would you provide this information ?

b. It is preferable that an attenuation- measuring microphone be placed within the same enclosure as the test item. The figure on sheet 12 of the SBRC Acoustic Test Procedure (# ALLE04) shows that the current plan is to bag that microphone separately.

What do you think about implementing these items ?

B. High level SINE sweep baseline (not currently reflected in PVP/PVS protoflight test matrix):

1. Reference SBRC memos:

R04697, 2-12-95; R04659, 2-17-95; R04635, 1-19-95;
R04569, 1-17-95; R04461, 12-21-94; R04454, 12-15-94;
R04453, 12-14-94; R04378, 11-18-94; R02770, 7-15-93;
R02220, 2-24-93

2. a. Baseline design levels appear to be:
(sweep rate: 2 or 4 octaves/min)

x		y&z	
freq.(Hz)	accel(g)	freq.(Hz)	accel(g)
5	.639	5	.639
8	1.5	9	2.0
15	1.5	17	2.0
15	2.5	17	3.5
35	2.5	30	3.5
35	1.0	30	2.0
50	1.0	50	2.0

b. Baseline (protoflight only) test levels appear to be:

Ref: SBRC memo " MODIS Structural Impacts of GIIS
Change 4, R04659 page 3.

All notches removed; input at instrument kinematic mounts.

3. The space view door, solar diffuser door, NADIR aperture door and sunshade, radiative cooler, and SAM were identified as strength-critical items. All items except the NADIR aperture door and sunshade were analyzed further and found to be OK for no notching. Is the NADIR aperture door and sunshade still critical ?

4. The initial notches have been removed " subject to test verification". A basic concern here is if after test the notches are found to be needed after all, and notching is not a sufficient qualification test, that hardware redesign/reprocurement/retest pressure will come very late in the delivery schedule.

C. Shock Baseline:

1. Ref SBRC memos:

M02096, 1-29-93; R00963, 4-14-92; R00884, 3-31-92;
R00340, 1-11-91

2. Baseline appears to be no shock testing at instrument level; testing will be done at EOS level. Design level given by R00963, input at instrument level.

3. My question here is have all MODIS (especially sensitive) components (not just structure) been analyzed/evaluated for shock survivability ?

D. Solar Diffuser Vibration Test Information:

1. Ref. SBRS memo Q05594, 1-4-96

2. PVP/PVS protoflight test matrix Rev D indicates " E " under random vibration. I requested the levels of this test spectrum, and you sent the Reference memo along with 152450 Rev A pp. 50-7, 50-8 and 50-9 (Workmanship Random Vibration levels for the Radiative Cooler). I assume that these workmanship levels correspond to the " Ew " for the radiative cooler, but I still don't have Solar Diffuser Levels Would you send ?

E. Approximate Component Acceptance Vibration Test Schedule:

1. Here is the info I have so far:

- a. radiative cooler, blackbody, and FAM..... DONE
- b. scan mirror (qual test only)...DONE
- c. door assemblies and SDSM....March
- d. SRCA.....March/April

Would you give me approximate dates for :

- e. SAM
- f. MEM
- g. Scan Motor/Encoder

2. My question here is are there any components which have not completed acceptance testing and which have structural adhesive bonds. I am proposing a sine burst test in addition to random vibration testing in such cases (including the AOP penalty test). The sine burst levels, however, would not exceed the component equivalent of the mass loaded mainframe qual levels (12.7, 9.8, 9.8) g's. I'm not suggesting that we go to 3-Sigma, like we did on the Fold Mirror penalty test.

What do you think of this ?

Author: Sal Cicchelli <scicchel@div720.gsfc.nasa.gov> at Internet
Date: 2/28/96 1:17 PM
Subject: **MODIS Scan Mirror Motor Bearing Lubricant**

Additional information on your question about MODIS scan mirror motor bearing lubricants:

Per Al DeForrest at SBRS, the lubricant being used in the flight bearing system is pennzane x2000 with lead naphthanate additive (2.5 or 5%).

The scan mirror motor bearing (not necessarily pennzane) functional temperature specifications are :

operational: -5 degrees C to 45 degrees C
survival: -35 degrees C to 60 degrees C

II. George Daelemans (IR Testing of CCAs)
from George Daelemans, 2/26/96

In light of Project cost and schedule constraints, I have come up with what I consider to be the minimal amount of IR testing of the CCAs to assure the long term reliability of the MODIS electronics. Each unique card layout needs to be IR imaged, while powered, over the qualification range. Additionally, I believe every board that is going to fly on this mission deserves a room temperature powered IR image as a workmanship check.

As of today it seems the request by SBRS *not* to perform a complete IR imaging record of their CCA's is a 'fate accompli'. I wish to remind the Project why GSFC requested this testing in the first place. Several analyses were completed by HUGHES EOS for SBRS, which suggested there are some high temperature regions on the CCAs. A set of guidelines was developed by Paul Bortfeldt, who was SBRS's cognizant thermal engineer during the design phase of the instrument. Several months after Paul's guidelines were issued, the first iteration of the CLAM

was reported to have temperatures which were so high that it did not perform correctly in air, and would surely not work at all in vacuum.

An investigation by Paul determined that his guidelines were not being followed. This same investigation discovered that a majority of the temperature sensors on the CCAs were not even remotely near the hottest regions. In an effort to ensure that GSFC was not going to receive an instrument that would have high temperatures on unmonitored discreet components, thus reducing orbital life, SBRS agreed to image the CCAs in vacuum with the thermal environment simulated.

Complete imaging of the EM CCAs was not finished until after the EM system level testing. To my knowledge, SBRS has not published the results of these measurements. My impression from seeing a few images was that 30°C gradients on the boards was not unusual. The manufacture's temperature limits were not being exceeded; however, we had some components that were borderline on the GSFC PPL 20 derating limits.

To further confound the situation many of the CCA boards underwent a design evolution from the EM unit to Protoflight unit, and I am still not sure if thermal considerations learned from the EM unit were applied (that problem of no published results) to the new card layouts. My last visit to SBRS, in late October 96, included speaking with Ed Clement, and at that time he assured me that they were planning to perform full IR imaging on each board.

I thought the Protoflight IR tests were to be conducted in vacuum, but at this point I would settle for air. The thermal cycling tests that I believe have been completed in air from -20°C to +60°C are non-power thermal stress tests and do not really demonstrate functionality at the qual limits. I still am advocating that SBRS perform a powered test of each card design with IR imaging. I have spoken with Ron Choo, who is very willing to support this activity. He believes he has access to an IR transparent window suitable for a non-vacuum temperature box (IR imaging of electronics boards is performed on a regular basis at HUGHES EOS in El Segundo). We should insist that SBRS image each unique card layout, powered, over the qualification range. Additionally I believe every board that is going to fly on this mission deserves a room temperature powered IR image as a workmanship check. We all know that SBRS is under a tight schedule, and that some wiring mistakes have already been made. This activity should be considered as insurance and can be done in parallel to the powered checkout of the CCA's. So with no more than a coordination call to the SBRS thermal engineers, NASA can be assured of the long term reliability of the electronic components going into our sensor.

Please feel free to contact me with any concerns you have on this subject. Thanks

III. Jose Florez (PFM CCA Temperature Testing and IR Imaging, Telecon with SBRS)

Author: Jose Florez at 730

Date: 2/28/96 2:24 PM

Subject: **Re: PFM CCA Temperature Testing and IR Imaging**

----- Message Contents -----

Jose,

I was surprised by a visit from Lee on this subject. Oh well.

Our current plan is to vacuum image the PF Formatter board, in lieu of the Engineering Model board. This will complete the vacuum imaging we were going to do for Engineering Model. I have been requesting a final report from Dave LaKonski at Hughes and will forward it when received. George Daelemans does have a list of all the EM boards we were planning on testing.

Our current plan on Protoflight, as requested by George, is to thermal image all Protoflight CCAs, but only in air and at ambient temperature. George requested this as a minimum test that will basically just prove there are no major hot spots. We plan to do this for the MEM, SAM, and FAM CCAs but did not get it accomplished for the SRCA and SDAM boards (which are very small with only a few components) so that should not be a great risk.

Ed

Subject: **PFM CCA Temperature Testing and IR Imaging**
From: Jose_Florez_at_730@ccmail.gsfc.nasa.gov at CCGATE
Date: 2/27/96 12:17 PM

Ed,

At the MODIS team meeting today the topic of test temperature range for the CCA's came up and resulted in a call to Lee Tessmer with the request that your systems and thermal guys formalize and document the requirements. Don't be surprised if you get a call from Lee.

The other topic discussed was IR Imaging of the CCA's. George Daelemans, our thermal engineer, is under the impression that it is being waived for the PFM. During our telecon yesterday I understood that the only MEM PFM CCA's that remain to be IR tested are the Formatter boards. Could you please clarify the status of IR testing for both the EM and PFM. Were all the EM boards IR'ed? Are any of the PFM boards not being IR'ed based on similarity to their EM counterparts? Also, is PFM IR testing conducted in vacuum or at ambient?

Thanks,

Jose

Author: Jose Florez at 730
Date: 2/26/96 4:52 PM
Subject: **Record of Telecon w/ SBRS - February 26, 1996**

----- Message Contents -----
Telecon with Ed Clement on 2/26/96, 4:00 pm

SBRC is in the process of issuing a Procedure for Workmanship Temperature Cycling (SBRC #153546) of unpowered electronics CCA's. An advance copy was E-mailed to GSFC. The

procedure does not require a hard copy of the temperature cycling data (such as a circular temperature graph), just the date temperature cycling is performed, the equipment used, and the number of cycles performed. With that approach there will not be any documentation of equipment problems which could result in CCA's being stressed.

Ed will go to Hughes Torrance on Wednesday for a data review of the PFM Power Supply which completed testing last Saturday. He will bring the unit with him to SBRS to start installation and test in the MEM enclosure.

IV. Ed Knight (December QMR Action Item #3)

Author: eknight@highwire.gsfc.nasa.gov (Ed Knight) at Internet

Date: 2/29/96 11:53 AM

Subject: Response to Dec. QMR A.I. #3

This action item states:

3. GSFC/MCST--Determine if earth scene data must be preserved if the calibration sector is delayed.

We are aware of three potential reasons for delaying the calibration sector data.

1. The SRCA sector undergoes a vernier delay during its Spatial Calibration Mode. We expect this to have no effect on the earth scene data collection. The earth scene data must be preserved.
2. The data sectors are rotated to allow us to scan the inside of the instrument cavity (Operational Activity 14 in Operations Concept Document). This is accomplished by a Table Load or command. Since we are using the Earth View Sector to scan the inside of the cavity, we expect that its view of the Earth will not be preserved. This is of course acceptable.
3. The SD sector is rotated to allow us to scan the upper corner of the cavity to monitor changes in response vs. scan angle (Operational Activity 17). This is still under study, but we understand that this can be done through the aforementioned Table Load and would not affect the earth scene data. We would want the earth scene data preserved during this activity if this is not the case.

If SBRS's question was directed at some other reason for delaying the calibration sectors, we need further clarification. Otherwise, this should answer the action item.

V. Bob Martineau (Flight Model Detector Status, Possible rail voltage change for NIR)

February 27, 1996

1) Flight Model 1 Detective Assemblies and FPAs:

- The NIR, VIS, and SMWIR F1 FPAs have been delivered. The F1 LWIR CTI was held Feb 16. The unit was accepted with the exception of a functional retest of the PC bands to determine whether a stair step appearance of the wave form was due to a test set anomaly as suspected, or

to something else. During the week, the stair step effect seen on the PC band functional test was traced to the use of incorrect apertures used to reduce the data. When correct apertures were used, the data was normal. The unit is being packaged for delivery

2) Flight Model 2 Detective FPAs:

- The F2 VIS and NIR FPAs have been delivered. The F2 LWIR DA completed radiometric testing and is awaiting a filter/bezel assembly. All pixels were operational. The filter/mask assembly is completed. A bezel has been sent to Speedring for mask pocket machining and is expected back on March 6. FPA delivery to Systems Division will occur 2 weeks later on about March 22.

- The F2 SMWIR DA completed radiometric tests and is also awaiting a filter/bezel assembly. The filter/bezel assembly is completed except for inspection. The FPA group expects to receive it on February 27. FPA delivery to SBRS Systems Division will occur 2 weeks later, on about March 12.

3) Saturation of NIR FPAs:

- Mary Ballard spoke to Neil Therrien about increasing the rails to alleviate premature saturation of the NIR FPA. Neil will investigate using -9V rails for the NIR FPA when the unit returns for final instrument test.

VI. John Mehrten (Telemetry Alarm Limits Information)

Author: "Mehrtten, John A" <jmehrtten@msmail3.hac.com> at Internet

Date: 2/29/96 2:37 PM

Subject: EOS Tlmy Alarm Limits Info

----- Message Contents -----

This msg SBRS Reference is 2/29/96 PL3095-I05654 Red & Yellow Limit Assignments & Response, Tlmy. The hardcopy form has the below Faxed LMMS IM attached.

Ref: LMMS IM 2/23/96 Red & Yellow Limit Assignments & Response (1 page)

o This msg forwards hard copies of the referenced LMMS IM to the TO's.

o As many know, Alarm limits are a major task completion item in my 2/25/96 CTD Status List.

o Remarks - - To general subject and to the Referenced LMMS IM.

1. Limit Goals - - The last IM paragraph stresses the goal of limits is to reduce risk of damaging Flt HW and injury to personnel. A number of us had just come to this realization in the last 6 months or so. The present MODIS limits that appear in CTD Table 20-5 Active Analog Tlmy and T20-6 Passive Analog Tlmy are blend of performance aspects for some, and drastic aspects

for others. My alarm limit review task is to transform all this to a safety aspect with coordination with key designers, SIT personnel & GSE SW personnel.

2. More Complex Task - - The more complex spin-off task related to limits, is how to identify and implement the GSE logic controls to turn off limit checks due to transitioning config chgs or variation in static configs and what's on/off.

3. IM Remark - - The IM indicates that the S/C will have 3 different sets of limits dependent upon the major activity phase: 1) ambient I&T, 2) T/V and 3) flight ops. I think a single set of alarm limits will satisfy MODIS rqmts. We'll see.

4. Just FYI Pts - - I believe for MODIS that there is another category of analog tlmy. In the case of MODIS, most of you are aware that we have a large number of analog tlmy signals. Some could argue now (we didn't at the beginning of rapid design efforts) that some analog tlmy pts are supplemental info pts to other prime pts in the following context. If a prime pt goes into Red Alarm (or even Yellow for that matter), then the supplemental pts will also be there. Further, at least for flight, for a lot of items, there will be nothing you can do about it, particularly if a HW failure has already occurred. The supplemental pts would just help you to maybe piece together a story of what's wrong or why it's wrong. In this context these pts are FYI, and would result in supplemental blood on the screen if their alarm limits are used in addition to the prime pts.

It seems to me we should have a "Don't Care" or an "FYI" category. "Don't Care" is not a good choice of words, because some might say, well, why have them? And they would have a point. Some might would further extend "why have them" to the supplemental FYI pts. Here, I understand their thoughts, but wouldn't necessarily agree about not having them.

VII. Hongwoo Park (Spectralon Pieces for Heliostat)

Author: hwp721@rs720.gsfc.nasa.gov (Hongwoo Park) at Internet

Date: 2/22/96 3:31 PM

TO: stu@opt-sci.Arizona.EDU at Internet

TO: wbarnes@neptune.gsfc.nasa.gov at Internet

Subject: Re: SRBC (heliostat and Spectralon)

----- Message Contents -----

Stu and Bill,

I have just talked to Ms. Jane Reno of Labsphere on the plates. Stuart's statement is correct that 24" X 24" plate is composed of 9 pieces. She said that a largest single piece which would be available is 19" X 22" for which she is preparing a price quote for Paul.

Hongwoo

VIII. Dan Powers (Technical Memos)

Technical Memos from Dan Powers:

Three MODIS thermal analysis memos have been received from Dan Powers:

1) "Updated MODIS Instrument Flight Temperature Predictions Based on Recent Design Modifications", February 13, 1996.

The +Z side of the space view shroud, telescope shroud, adapter, and lower scan cavity shroud doubler which were previously blanketed are now covered with a combination of Optical Solar Reflectors (OSRs) and S13GLO white paint. The white paint covers areas where it would be difficult to install the OSRs, about 50 % of the region. Some of the new temperatures include:

Instrument Region	New Hot Case (Deg C.)	New Cold Case (Deg C.)
Calibration Bulkhead	7.1/10.1	-2.7/-0.7
Zenith Bulkhead	10.2/11.4	-0.9/0.3
Optics Bench Bulkhead	-0.7/10.2	-10.3/0.5
Scan Mirror	12.8	2.5
Blackbody	10.0	-0.9
Afocal Telescope Assembly	-1.0/4.2	-10.8/-5.6
Aft Optics Platform	-4.3/1.5	-14.2/-8.3
LWIR Objective Assembly	-0.5/-0.3	-10.3/-10.0
S/MWIR Objective Assembly	0.7/0.9	-9.0/-8.8

2) "Updated MODIS Survival Heater Requirements Based on Recent Design Modifications", February 14, 1996.

The MODIS heater power requirements were re-evaluated based on the recent thermal design modifications. The two worst cases investigated were a survival mode with +90 degree pitch (S/C velocity vector in Z direction) and a Sun Pointing Safe Mode (SPSM) with the nadir side alternating Earth facing (S/C + X axis always pointing away from the sun). Doors are closed in each case. Current heater power allocations sufficient to keep electronics above - 20 degrees C except for the Forward viewing Analog Module (FAM) heater, which required 10.5 watts for the SPSM with the OSR/White instead of the allocated 10.0 watts. Worst case cold scenarios were used and the heaters were assumed to be located on the radiators when they will instead be on the slightly warmer electronics.

3) "MODIS Electronics Module (EM) Temperature Predictions for Survival Heater Failure Scenarios", February 20, 1996.

Two worst case cold scenarios were modeled to determine if the electronics module temperatures go below their low qualifying temperatures if no heater power is available.

In the first case, the instrument is at steady state for a baseline cold case. The S/C then goes into SPSM and the survival heaters do not turn on. The electronics modules begin to fall below their minus 35 degree C qualifying temperatures after about 20 hours.

In the second case, the S/C has been in SPSM long enough for MODIS to reach thermal steady state with the Main Electronics Module (MEM), Space viewing Analog Module (SAM), and FAM heaters controlled to minus 20 degrees C. The survival heaters then turn off. The electronics modules begin to fall below their minus 35 degree C qualifying temperatures after about 5 hours. The Cooler Located Analog Module (CLAM) is already at minus 38 degrees C before the other survival heaters turn off (the CLAM has no heaters).

IX. Jim Young (RE: NASA resp to STR 60 deletion)

Author: "Young, James B" <jyoung@mssmail3.hac.com> at Internet

Date: 2/26/96 11:52 AM

TO: Mike Roberto at 420/421/422/424

Subject: RE: NASA resp to STR 60 deletion

----- Message Contents -----

Mike,

I had your address wrong on the first attempt. Perhaps this will work.

I expect we may discuss some of the issues brought up in this Email message in the Monday NASA / SBRS system engineering telecon. I thought it might help communication if some comments could be made before the telecon. My comments will be itemized consistent with Bill Barnes numbering used below.

1. I don't have any data on the possible use of heat guns in the re-work. If used it is conceivable that the coatings could be affected. I presume there were no heat gun usage in the radiative cooler where bandpass filters and mask coatings are located. We need to know whether heating was applied near any of the beamsplitter elements.

2. I am puzzled by the reference to out of band spectral measurements. STR 60 did not relate to out of band measurements, at least in my mind. It was related to correcting in band spectral response effects due to atmospheric absorption. It is my understanding that the system level dispersive out-of-band measurements are still in our baseline PFM testing sequence.

3. Optical piece part measurements certainly were not done in a water free environment. However I don't believe this is necessary. Visualize the following - A monochromator is used as the dispersive system. Signals are taken with the optical element in and out of the path. The exact same path is used so the same atmospheric absorption is in both measurements and thus cancel out.

4. We know that the SpMA had anomalous behavior especially in the VIS and NIR regions. See PL3095-N05151 entitled "EM relative spectral response test - SpMA anomalous performance" for an explanation. However you may be referring to other things. If so, please elaborate.

5. Again I am puzzled, see response to item 2. However the same question may be asked with reference to in band relative spectral response.

6. As you indicate when the MCC calcium fluoride window is in place no measurements can be made on bands 31 through 36.

In reference to Gerry Godden comment on there may be 13 IR bands that will need corrections for water vapor or carbon dioxide. Per J. Walker IM PL3095-T03263 entitled "Atmospheric transmittance analysis for MODIS spectral bands" dated 21 December 1992. Spectral bands 18, 19, 20, 24, 25, 26, 27, 28, 29, 33, 34, 35, and 36 have integrated transmittance / absorption effects ranging from 0.7 % for band 20 to 62.7 % for band 27. Our radiometry equations use the relative spectral response rather than an absolute spectral response function.. All MWIR / LWIR bands are calibrated with the MODIS and BCS inside the evacuated MCC. Thus there will be no atmospheric absorption effects during this calibration. Nevertheless the true relative spectral response function is needed.

Jim Young

